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ABSTRACT

Experiences with computer-assisted instructional (CAI) programs written for religious studies indicate that CAI has contributions to offer the humanities and social sciences. The usefulness of the computer for presentation, drill and review of factual material and its applicability to quantifiable data is well accepted. There now exist experimental CAI programs which can also deal effectively with non-quantified, ambiguous subject matter and which can help students develop the skills of interpretation, of analysis, and in making and defending critical judgments. A CAI program in use at California State College at Bakersfield teaches students about the Graf-Wellhausen theory of biblical authorship and the evidence for it, gives them practice in using methods of literary criticism, and elicits judgments about the theory. The program taught the material more effectively than the program's author had been able to do with lectures, and students learned better and more quickly. (PB)

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RELIGIOUS STUDIES AS A TEST-CASE FOR COMPUTER-ASSISTED INSTRUCTION IN THE HUMANITIES

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Participants in this conference last year were told of the Northern California Regional Computer Network and its project to train college faculty members in the use of the computer for instructional purposes [1]. I came into that project last summer, and participated in the second year of its program. During the project, the PYLON language became operational at the Stanford Computation Center. Because PYLON uses very few and very simplified commands, the teachers, particularly those of us in the humanities disciplines, were able to concentrate on writing programs for classroom use, with only a small amount of our attention devoted to learning programming skills.

At several times during the project, I felt that my presence was a sort of "acid-test" for computer-assisted instruction (CAI). "If you can teach religion on the computer, you can teach anything on the computer." Religious Studies is, in fact, a convenient sort of barometer for testing the instructional value of the computer, since the field draws upon the methodologies of so many disciplines in the social sciences and humanities. From my very limited experience of one year, I should like to offer some observations and tentative conclusions. Finally, I want to describe one series of programs which I believe points to a new direction in the use of the computer in CAI.

Drill and Information

Some of my programs did not, in my opinion, offer substantial improvement over older methods of teaching, but others did. As examples of the first category, let me mention two programs which I developed in connection with the study of Indian religions, one of them concerned with the caste system and the other with the four ideal "stages of life" in Hinduism. The programs reinforce what the student already knows about the subject, provide new information when needed or correct misinformation, and give the students some drill in the use of technical terminology. Answers are accepted with either English terms or Sanskrit terms, but if the student only knows the English-language answer, then he or she is provided with the technical term in Sanskrit. One program has an optional drill in the Sanskrit terminology, available at the choice of the student.

What do these programs accomplish? The student has the advantage of being able to use the programs privately at his or her own convenience. The computer can check for comprehension and can "fill in the gaps" which might never be detected in a lecture class. A slow student can repeat the programs as needed.

At this point in time, the computer enjoys the advantage of novelty. The student who says "This is fun!" naturally gladdens my heart. Sitting at a computer keyboard occasionally offers some variety from sitting in hard chairs in a lecture room at an assigned hour. However, I suspect that the time is coming when the fad-value of the computer will wear out. I shall not mourn the loss.

Let me now cite some instances in which the computer can do things much better than I was ever able to do them by more conventional means. For example, the computer can present what I have come to call (privately) the "boring background." I have always thought that students who were beginning the study of religions had a right to know some elementary details about the size and distribution of major religious groups. Students can gain a helpful perspective on their study if they know at the very beginning that there are more Hindus in India than there are Zoroastrians or Jains. They are often surprised to discover that there are more Muslims in India than in Egypt, and that they are a majority in Indonesia and a very significant minority in Yugoslavia, China and Black Africa. Shinto is rare outside of Japan, but Buddhism and Christianity have spread into many countries. The student who knows this kind of detail has a context for subsequent study, but I have always felt reluctant to stand in front of a group of students reading a list of population statistics which I do not expect them to remember anyway. CAI offers a better way. The student sits down at the terminal, and is asked, "Guess which is the largest religious group in the world." The interactive conversation which follows maintains the student's interest and personal involvement, and in approximately fifteen minutes gives the student an overall

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picture of the religions of the world from which he or she can proceed. This particular program even types out a little graph for the student. The program also has the important secondary objective of familiarizing the student with the use of a computer terminal early in the semester.

Another kind of "boring background" consists of the sort of chronological details which students need to know in order to understand the development of an idea or movement. Cannot CAI provide the answer? The good student could zip through a "remedial chronology" program in five minutes, or skip it entirely. The slower student could take as much time as he or she needs "to get it together."

The Challenge of the Humanities

However, it seems to me that the computer can be used in the humanities in much more innovative ways. Drill programs have a value. Remedial programs of all sorts and programs of individualized instruction do not need to be defended before this group. Nevertheless, faculty members in the humanities are not likely to become rabid enthusiasts of CAI if we can offer nothing more. The problem with the humanities, as I see it, is that we do not deal primarily with questions that "have right answers." Ambiguity is our stock-in-trade. In the usual sort of discussion which faculty members conduct in our humanities classrooms, we would seldom, I hope, ask a question that could be answered with a "yes" or a "no." We rarely ask questions that demand quantified answers. Some of us would argue that the question which has only one right answer is a question not worth asking. We deal with matters of interpretation and with value-judgments. When I enter a Religious Studies classroom, I may have opinions and interpretations, but I certainly do not want to impose my value-judgments upon my students. My purpose is, rather, to encourage them to become more aware of the value-judgments they bring with them, and to help them analyze their own points of view. I want them to become better able to think and reason. I want them to be able to criticize their own ideas objectively and to criticize the ideas of others. At the same time, I would hope that they would become more appreciative and sympathetic toward the practices and beliefs of other persons and other cultures.

Where does that leave us with reference to CAI? The binary computer is suited, is it not, to deal with yes's and no's and with quantifiable answers? Does that mean that computers must necessarily be left on the periphery of the humanistic disciplines? At last year's conference, a historian spoke of the distinction between "facts" and "interpretation" in her discipline:

> The computer can impart the facts and events of a certain period. But a group of facts is not history; however a student must have a background of events before these same events can be interpreted. A teacher, therefore, can be relieved of the burden of fact presentation and can take the valuable classroom time for discussion, theories, and interpretations [2].

I would certainly not disagree with that position. The computer has great potential for the presentation, drill and review of information. Still, many humanists and social scientists will not become excited about CAI if the computer cannot rise to the challenge of helping students to interpret, analyze and defend.

Teaching Skills of Interpretation and Defense

I have one series of programs that points in that direction. The subject is the documentary hypothesis of K. H. Graf and Julius Wellhausen concerning the literary composition of the first five books of the Bible. According to tradition, Moses is the author, but for over a century some scholars have argued that those books were actually written by several authors, much later than the time of Moses. The purpose of the programs is three-fold: (a) I want students to learn what the Graf-Wellhausen theory is about and what evidence there is to support it. (b) They will have some practice in using methods of literary criticism as they make judgements about particular details in the text. (c) Finally, they are asked to take a position either for or against the hypothesis as a whole, and then they are asked to defend that position against possible objections.

Students are led through the kinds of observations which gave rise to the hypothesis in the first place. Wherever possible they are given the opportunity to discover the evidence for themselves. At the very beginning, students are told that they need not agree with any of the observations that scholars have made, but only that they should be aware of the various points of view. When they make judgements about the text--as they are asked to do several times--they are told that there is no single correct opinion, but that they should be

able to defend whatever judgement they make. The programs approach each aspect of the subject with as few directions to the student as possible. Typically, the first question in a series will be a very vague, open-ended "What do you notice about this passage?" If the student's answer contains certain key-words, he or she will be complimented for being so observant. There can be no critical "You are wrong" from the computer if those key-words do not appear, for two reasons. The student might have made a very original, clever observation which I did not anticipate when writing the program. Also, the student might not agree with the particular opinion which the Graf-Wellhausen hypothesis would consider "correct" at that point. Therefore, the program is likely to type out something such as the following: "Some scholars have noticed that . . . Do you agree with them?" The underlying assumption here, on my part, is that the student should be aware of what some critical scholars have said, but agreement is not necessary.

When students take a position with reference to the whole theory and defend themselves, they are not told "right" or "wrong." If certain key-words appear in their answers the computer might respond, "You are convincing me" or "Not bad." The program presumes that if those words are present then the student probably is dealing with relevant issues. If none of those words appear, the computer might type, "I'd be more convinced if . . . " Either way, it would go on to pose a new objection for the student to consider. If the designated key-words are likely to be used for different sorts of student answers, the computer might test a likely alternative with the student by typing, "Let me see if I understand you correctly. Are you saying that . . .?" Sometimes the computer simply ignores the student's defense and responds to any answer with: "If that is your conclusion, I'll have to accept it."

Not only do I consider that my CAI programs met their three goals very effectively, but they solved a long-standing instructional problem for me. It has always been difficult for me to teach about the Graf-Wellhausen hypothesis. I never found an adequate written explanation of it that I could assign to students. I have tried to explain it in lectures with some sort of success, but not, I fear, with much enthusiasm. The problem, as I see it, is that both lecturing and reading are passive modes of learning; they are appropriate for certain purposes, but not for learning methodology or for testing hypotheses. Most human beings cannot understand a hypothesis until they test it personally in a laboratory situation; they cannot learn a methodology very well until they actually use it. One of my first teachers of Old Testament solved the problem as far as the Graf-Wellhausen theory was concerned by assigning a long term paper. Students learned methods of literary criticism by struggling with the text themselves. At the end of that process, their papers were criticized very carefully with detailed comments. I have tried a similar approach myself, but found some disadvantages. In an earlier period, this hypothesis was on the cutting edge of scholarship, so that it was justified to ask students to spend the time necessary to produce a major term paper dealing with it. Today, there are newer, more exciting scholarly problems that have equal or greater claim on the student's attention. This topic ought not to be ignored, but I should prefer to find a way to cover it more quickly. Also, I found a more basic disadvantage with the assigned paper. Each student needed individual attention at different stages in the process. Some needed help to be able to perceive the evidence upon which the hypothesis is based. Also, I began to notice certain kinds of logical errors which repeated themselves in student papers. What should I do? If I pointed out the pitfalls in advance, I would rob the student of the laboratory experience of personal struggle with an issue. If I refused to give any individual help before the papers were completed, some students would be quite confused; for most of them, the help came too late to contribute much to the learning process. Finally, I was never able to resolve to my satisfaction the proper relationship between grading and a learning exercise in which I expect the student to learn by trial and error. Often a student who is fearful of his or her grade will pursue a "safe" course and tend to follow the known consensus. Should the braver student be penalized for venturing an original guess, even if it fails to produce results?

CAI can solve many of these difficulties very effectively. The student is asked to use a series of short programs without being graded on performance. He or she is presented with data in a step-by-step fashion and is asked to make observations about the data. The student's observations can be compared to previous findings of scholars, but without any implication that the student ought to agree with earlier conclusions. When the student is unable to notice anything in the text, hints are given. If the student does not require such help, the computer maintains a discreet silence. If he or she does not understand, the computer provides another example. In my particular programs, I have tried very hard to assure the student that there is no single right answer; in fact, they encourage individual judgements. Once the student understands the particular hypothesis which the programs describe, he or she is asked to defend it, attack it, or take some position in between. Whatever position the student takes, the computer explains that it will disagree; it will try to find objections to the student's position and ask for further defense.

What sort of results can I report for these experimental programs? I have used them with only a small sample of students, so whatever I say must be tentative at this point. However, my impression is that my students learned far more this year because they used my new CAI programs. They went through the series of programs in about one to three hours. When I tried to communicate the same information by means of lecture, I used to take as much as four hours. That is far less time than they spent in those years when I assigned a paper on the topic. When my students completed the CAI programs this year, I asked them a series of questions orally about what they had learned. I was much more confident about their level of comprehension than I had been with those students who had only heard my lectures. Probably my earlier students who had written ten and twenty-page papers on the documentary theory had the best grasp of it, but at the cost of far greater investments of time.

In essence, CAI has created a laboratory in which students can learn methodology and test a hypothesis. My programs are only a small beginning dealing with a single problem in literary criticism, but I should hope that teachers of history, philosophy, literature and other fields could also utilize the computer to help their students learn to interpret data, and to make and defend critical judgements.

NOTES AND REFERENCES

1. Ronald L. Code, An experiment in computer training for college faculty. Proceedings of the 1972 Conference on Computers in Undergraduate Curricula, 555-566. The project is supported by the National Science Foundation and makes use of the facilities of the Stanford Computation Center. See also now Stanford University Computation Center, Northern California Regional Computer Network: Activities Report to the National Science Foundation Covering the Period April 15, 1971, through June 30, 1972.

2. Betty L. Jehn, A computer-assisted instruction program in american histroy, 1870-1921 Proceedings of the 1972 Conference on Computers in Undergraduate Curricula, 440.

APPENDIX I

SAMPLE RUN (abbreviated here)

HYPCLOC

THIS PROGRAM IS DESIGNED TO TEACH YOU SOME THINGS ABOUT THE
SO-CALLED "DOCUMENTARY HYPOTHESIS" AS FORMULATED BY JULIUS
WELLHAUSEN AND OTHERS. I SHALL ASK YOU SOME QUESTIONS, AND
YOU SHOULD TYPE IN YOUR RESPONSE AT THE UNDERSCORE (_).

FIRST, WHAT IS YOUR NAME? george
ALL RIGHT, GEORGE, WHO WROTE THE FIRST FIVE BOOKS OF THE BIBLE,
ACCORDING TO TRADITION?
moses
YOU ARE OFF TO A GOOD START.
DO YOU KNOW WHAT THOSE FIRST FIVE BOOKS ARE CALLED?
THEY ARE CALLED the pentateuch
RIGHT YOU ARE.
TORAH IS THE TRADITIONAL JEWISH NAME FOR THEM. THEY ARE ALSO
CALLED THE PENTATEUCH ("penta" = 5).

PEOPLE VERY EARLY NOTICED THAT THERE WAS A PROBLEM WITH SAYING
THAT MOSES WROTE THE TORAH. IF YOU ALREADY KNOW THE BASIS OF
THEIR SUSPICION, TELL ME:
some things in the text reflect later conditions, after moses.
YOU ARE RIGHT, OF COURSE, BUT THERE WAS AN EVEN MORE OBVIOUS
PROBLEM. TRY AGAIN.
I don't know.
AT THE END OF THE PENTATEUCH THE AUTHOR SAYS,
"Moses . . . died there."
DOES THAT SEEM STRANGE TO YOU" yes
WHY? moses could not have written about his own death.
O. K.
ALSO, RIGHT AFTER THE REPORT OF MOSES' DEATH AND BURIAL (DEUT. 34),
THE TEXT SAYS,
"No man knows the place of his burial to this day."
HOW DO THOSE LAST THREE WORDS STRIKE YOU?
they seem later than the event they are talking about.
A GOOD OBSERVATION, GEORGE.
MANY PEOPLE CONSIDERED THESE WORDS TO BE ANACHRONISTIC. THAT IS,
"this day" IS SHARPLY DISTINGUISHED FROM THE TIME OF BURIAL. IT
SEEMS LIKELY, THEREFORE, THAT THE TIME OF WRITING WAS MUCH LATER
THAN THE TIME OF BURIAL. AGAIN (SO THE ARGUMENT GOES), MOSES
WAS NOT THE AUTHOR.
WOULD THESE OBSERVATIONS ABOUT THE END OF DEUTERONOMY CONVINCE
YOU THAT MOSES DID NOT WRITE THE TORAH?
yes
WHY DO YOU SAY THAT?
a man cannot write his own obituary.
PROBABLY NOT MANY PEOPLE WOULD HAVE BEEN CONVINCED IF OUR
EVIDENCE WERE SO LIMITED. AFTER ALL, MOSES COULD HAVE WRITTEN
EVERYTHING EXCEPT THE LAST CHAPTER.
HOWEVER, AS EARLY AS THE 18TH CENTURY, PEOPLE NOTICED
ANOTHER PROBLEM. JEAN ASTRUC, A FRENCH PHYSICIAN, OBSERVED THAT
THE PENTATEUCH USED SEVERAL NAMES FOR GOD. IN A LATER PROGRAM I
WANT TO ASK IF YOU THINK THAT IS IMPORTANT, BUT FIRST I NEED TO
SEE IF YOU ARE FAMILIAR WITH THE BIBLICAL NAMES OF GOD. . . .

APPENDIX II

Sample Run (abbreviated here)

HYPCDOC3

I AM GOING TO TYPE OUT A FEW PASSAGES FOR YOUR, GEORGE. IF YOU NOTICE ANYTHING THAT SEEMS STRANGE TO YOU, SUCH AS ANY CONTRADICTIONS, UNUSUAL REPETITIONS, OR "BREAKS" IN THE NARRATIVE, DESCRIBE WHAT YOU SEE (ON ONE LINE). I WON'T ALWAYS ASK YOU SPECIFIC QUESTIONS, BUT WILL PROMPT YOU WITH AN UNDERSCORE (_). DESCRIBE WHATEVER YOU SEE.
IF YOU DO NOT NOTICE ANYTHING SPECIAL, JUST PUSH THE CARRIAGE-RETURN.

Thus the heavens and the earth were finished, and all the host of them. And on the seventh day God finished his work which he had done, and he rested on the seventh day from all his work which he had done. So God blessed the seventh day and hallowed it, because on it God rested from all his work which he had done in creation. These are the generations of the heavens and the earth when they were created.
In the day that the LORD God made the earth and the heavens, when no plant of the field was yet in the earth and no herb of the field had yet sprung up--for the LORD God had not caused it to rain upon the earth, and there was no man to till the ground; but a mist went up from the earth and watered the whole face of the ground--then the LORD God formed man of dust from the ground, and breathed into his nostrils the breath of life; and man became a living being. . . .
Then the LORD God said, "It is not good that the man should be alone; I will make him a helper fit for him" (Gen. 2).

It seems repetitious to me.
WHAT ELSE DO YOU NOTICE?
That's all I notice.

YOU ARE VERY OBSERVANT, GEORGE.
IT IS OFTEN POINTED OUT THAT GOD HAS ALREADY FINISHED CREATION HERE, INCLUDING THE CREATION OF MAN, BUT THEN HE SEEMS TO START ALL OVER AGAIN, THIS TIME BEGINNING WITH THE CREATION OF MAN. IN GEN. 1:27, MALE AND FEMALE HAD ALREADY BEEN CREATED, BUT IN GEN. 2:18, THE MAN IS ALONE.

(IF YOU DO NOT AGREE WITH ANY OF THESE STATEMENTS, GEORGE, THAT IS FINE. YOU NEED NOT AGREE. IN A LATER PROGRAM, WE SHALL TALK AT LENGTH ABOUT YOUR OWN OPINIONS AND CONCLUSIONS.)

GEN. 6: God said to Noah, . . . "And of every living thing of all flesh, you shall bring two of every sort into the ark, to keep them alive with you."
GEN. 7: Then the LORD said to Noah, . . . "Take with you seven pairs of all clean animals."

Noah is told to bring one pair of each animal, and then seven.
WHAT DO YOU MAKE OF THAT?
It seems contradictory.
WOULD YOU THINK THAT TWO DIFFERENT AUTHORS MIGHT HAVE WRITTEN THOSE TWO STATEMENTS?
_maybe
GEN. 32:28: (God) said, "Your name shall no more be called Jacob, but Israel."
GEN. 35:10: And God said to him, "Your name is Jacob; no longer shall your name be called Jacob, but Israel shall be your name."

Jacob is told the same thing twice.
DOES IT SEEM UNUSUAL TO YOU THAT JACOB'S NAME IS CHANGED TWICE?
yes
THAT IS FINE FOR NOW, GEORGE; I'LL ASK YOU TO DEFEND YOUR CONCLUSION LATER.